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(54) VERTICALLY SUSPENDED COMPRESSED AIR DRIER

(71) We, ALSTHOM ATLANTIQUE formerly Societe Generale De Constructions Electriques et Mechaniques Alsthom S.A., a French Body Corporate of 38 Avenue Kléber, 75784 Paris Cedex 16, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a compressed air drier used for preventing condensation in pipes feeding brakes or other compressed-air operated devices, e.g. railway coaches. It relates particularly, but not exclusively, to a drier which can be fixed under the floor of an underground railway coach.

A compressed-air drier for removing water vapour and oil from compressed air is known. Such a drier is commonly installed between an air compressor and a dry air storage reservoir on underground railway stock. Such known air driers generally comprise two filter chambers: a first filter chamber with metallic meshes intended for absorbing drops of oil and water; and a second chamber for drying the air, the second chamber is filled with grains of alumina or with some other water adsorbent material. In normal operation air coming from the compressor reaches the first chamber, passes into the second, passes through it and emerges in the direction of a main reservoir and of a smaller, regeneration reservoir. However, under the control of an electrically operated valve, both the drying and filtering chambers can be brought to atmospheric pressure and the resulting pressure drop draws in air from the regeneration reservoir, this air passing through the two drying and filtering chambers in the opposite direction to that of the first, normal operation. This second operation is for regenerating the water absorbent material, e.g. alumina, in the drying chamber.

In driers manufactured up till now, the air inlet pipes of the compressor are connected on the side and towards the bottom of the filtering chambers. The two drying and filtering chambers are interconnected by a tube arranged between the side of the filtering ring chamber and the top of the drying chamber. A pipe at the base of the drying chamber provides its connection to the main and regeneration air reservoirs.

Former driers have the disadvantage of not being adapted to fit beneath a floor as required in underground railway coaches. This is because their pipes are disposed on all the faces of the filter chambers and removal of a cover for maintenance must be carried out from above.

Preferred embodiments of the drier according to the present invention remedy this drawback. Indeed, in use such driers are suspended vertically thereby allowing maintenance to be performed by lowering the two filtering and drying chambers without having to dismantle the various pipes.

The present invention provides a compressed air drier adapted for vertical suspension in use and comprising a first chamber containing a metallic fibre filter and a second chamber containing water adsorbing material, the first chamber having an inlet for connection to a compressed air feed pipe, and an outlet connected to an inlet of the second chamber; the second chamber further having an outlet for connection to a compressed air storage reservoir, wherein the chambers are each partially delimited by respective chamber bodies, both of which are detachably mounted to a mounting plate adapted to be fixed to a support for the drier, the mounting plate also serving the function of being a cover for the chamber bodies and of providing the said inlets and outlets to the chambers.

In a preferred embodiment of the invention, the compressed-air enters a first axial tube of the first chamber from the top, the interconnection between the chambers is formed by a bore in the mounting plate and

the compressed air leaves a second axial tube of the second reservoir from above.

The first chamber may include a vent in its detachable body connected to an electrically operated valve via flexible tubing, the second chamber outlet communicating with an auxiliary regeneration reservoir for supplying air for regenerative venting through the water adsorbing material under the control of the valve.

The metallic fibres of the first chamber may be inserted between two grids supported by the first axial tube.

The adsorbing product of the second chamber may be disposed between two grids supported by the second axial tube, the bottom one being stationary and the top one being spring-loaded.

An embodiment of the present invention is described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a schematic elevation of filtering and drying chambers;

Figure 2 is a top plan view of the chambers of Figure 1;

Figure 3 is a vertical cross-section, enlarged in relation to Figure 1; and

Figure 4 is a cross-section along A—A in Figure 3.

The same references are used for the same elements when they occur in different figures.

As is apparent in Figure 1, a filtering chamber 1 and a drying chamber 2 are cylindrical and are suspended with their axes vertical. Air and impurities contained therein coming from the compressor, not shown, enter through the top of the filter chamber 1. This air, at a pressure of 9 bars for example, passes initially downwardly through an axial tube 3 and then rises again (arrows drawn in continuous lines) through metallic fibres which are installed round the axial tube 3 in the filtering chamber 1. The metallic fibres collect droplets of water and oil which are in suspension in the compressed air. The compressed air then passes to the drying chamber 2 through a passage 4 consisting of a hollowed out part in a mounting plate 5 forming a cover common to both the chambers 1 and 2. The air passes through a water vapour adsorbent material which can be provided in the form of grains of alumina. This adsorbing material is disposed on the outside of an axial tube 6 going down into the chamber 2. After passing through the adsorbent material, the air enters the axial tube 6 and passes through a valve 7 disposed at the top of the mounting plate 5 to fill a main purified air reservoir for storing compressed air for use. An auxiliary regeneration reservoir also containing purified compressed air communicates with the axial tube 6 by means of an inlet orifice 8. For regeneration of the water adsorbent material, the compressor is stopped and the pressure in the tube 6 is reduced to atmospheric pressure by the operation of an electrically operated valve (not shown) leading to an orifice 9 disposed at the base of the filtering chamber 1. The regeneration path of the adsorbent material is shown in dashed lines adjacent the orifices 8 and 9 while between the orifices 8 and 9, it follows the reverse path of the arrows shown in continuous lines.

Figures 2, 3 and 4 show the drier in detail. As shown in the figures, the mounting plate 5 consists of a single part formed by two sectors of circumference which fit as a cover over both the chambers 1 and 2. The chambers have tubular bodies which are fitted with a common flange 10 which is connected to the mounting plate 5 by a plurality of bolts such as 11. Two O rings 12 and 13 seal the chambers. The mounting plate 5 is fixed laterally to a support 14 by a plurality of bolts such as 15, this enabling the mounting plate and the pipes which lead to it to be fixed.

The axial tube 3 is fitted in a bore 16 in the mounting plate 5 and is sealed by an O ring 17. A top grid 18 and a bottom grid 19 support between them the metallic fibres 20. This entire assembly is supported by a tab 21 bearing on the flange 10.

Likewise, the axial tube 6 is fitted in a bore 22 of the mounting plate 5 including an O ring seal 23. The grains 26 of the adsorbent material are held between a top grid 24 and a bottom grid 25. To prevent them from being shaken during running of the train, a spring 27 bears down on the top of the top grid 24. The assembly formed by the tube 6, the grains and the spring is supported by a tab 28 bearing on the flange 10.

A valve 7 set to the pressure prevailing in the drying chamber 2 and preventing the return of air from the main storage reservoir is screwed in the bore 22. The orifice 8 communicates with the regeneration reservoir via a diaphragm 29 whose function is to regulate the passage of the regeneration air.

The orifice 9 at the base of the filtering chamber 1 is connected to the electrically operated valve by a tube which is preferably flexible.

It follows that for the maintenance of the device, it is only necessary to detach the chambers 1 and 2 from the mounting plate 5 by unscrewing the bolts such as 11, this making it possible to lower the chambers with their contents since the axial tubes 3 and 6 are a sliding fit in the mounting plate 5.

The present air drier can be used in all applications requiring a vertically suspended drier and where access from above is difficult. Such an application is the breaking circuit of an undegroound railway train.

WHAT WE CLAIM IS:—

1. A compressed air drier adapted for vertical suspension in use and comprising a first chamber containing a metallic fibre filter and a second chamber containing water adsorbing material, the first chamber having an inlet for connection to a compressed air feed pipe, and an outlet connected to an inlet of the second chamber; the second chamber further having an outlet for connection to a compressed-air storage reservoir, wherein the chambers are each partially delimited by respective chamber bodies both of which are detachably mounted to a mounting plate adapted to be fixed to a support for the drier, the mounting plate also serving the function of being a cover for the chamber bodies and providing the said inlets and outlets to the chambers.

2. A drier according to claim 1 wherein the first chamber includes a vent for venting the chambers to atmospheric pressure and the second chamber outlet communicates with an auxiliary regeneration reservoir.

3. A drier according to claim 2 including an electrically operated valve connected to the vent to control venting therethrough.

4. A drier according to claim 2 or 3 wherein the vent is constituted by an opening in the detchable body of the first chamber and is connected to the said electrically operated valve through flexible tubing.

5. A drier according to any previous claim wherein the compressed air enters the first chamber from the top via a first axial tube, the interconnection between the chambers is formed by a bore in the mounting plate and the compressed air leaves the second chamber from above via a second axial tube.

6. A drier according to claim 5 wherein the metallic fibres of the first chamber are supported between two grids mounted on the first axial tube.

7. A drier according to claim 5 or 6 wherein the adsorbing material of the second chamber is supported between an upper and a lower grid mounted on the second axial tube, the lower grid being fixed and the upper grid being resiliently biassed towards the lower grid.

8. A compressed air drier substantially as herein described with reference to and as illustrated in the accompanying drawings.

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Sheet 1

FIG.1

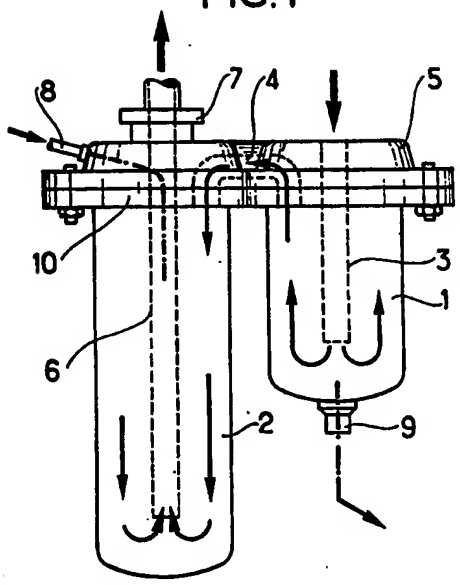
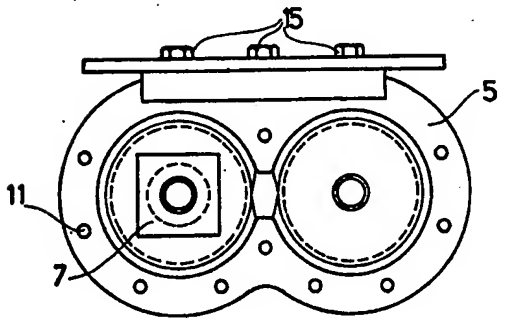


FIG.2



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Sheet 2

FIG.3

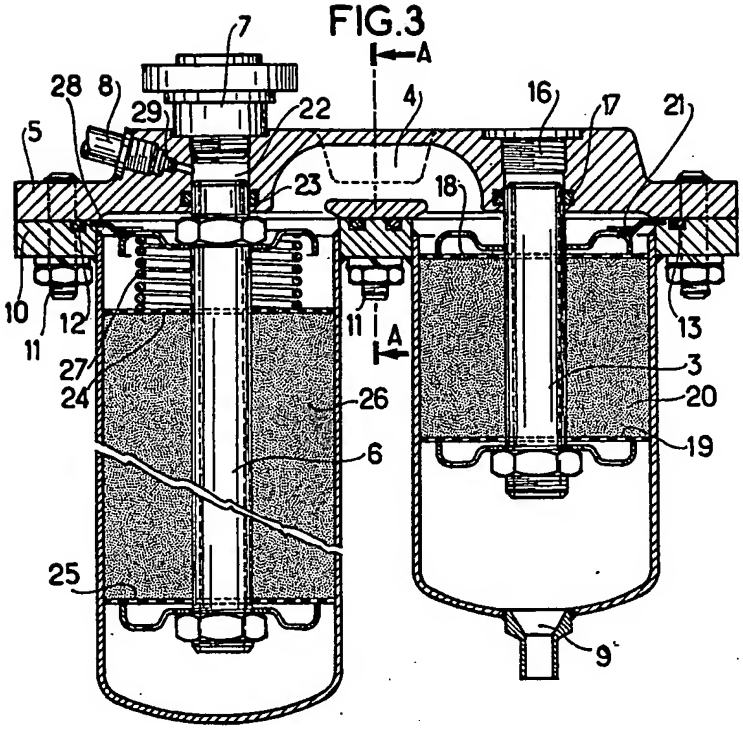

FIG.4